

# **CBO**

## **TESTIMONY**

Statement of  
Robert F. Hale  
Assistant Director  
National Security Division  
Congressional Budget Office

before the  
Subcommittee on Projection  
Forces and Regional Defense  
Committee on Armed Services  
United States Senate

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I appreciate the chance to testify before this Subcommittee about trends in the Navy's shipbuilding budgets. Ships take years to build and spend decades in the fleet. Thus, analyzing shipbuilding budgets demands a long-term perspective. My testimony today will focus on shipbuilding budgets over the next decade and discuss how those budgets will affect the Navy fleet through the year 2020.

### KEY FINDINGS

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My testimony suggests three main conclusions:

- o The Navy's publicly stated goals for numbers and types of ships would require real increases in shipbuilding funds of about 5 percent a year through the end of this decade;
- o If, instead, shipbuilding budgets decline along with the rest of the defense budget, then the Navy of 2020 will be much smaller--perhaps only two-thirds of its current size or even less--and its missions will have to be reconsidered;
- o For example, emphasis on the Navy's power projection mission--which would result in relatively larger purchases of aircraft carriers and other

ships--could lead to sharp declines in numbers of attack submarines and other ships intended primarily for the sea control mission.

The Congressional Budget Office (CBO) based these conclusions on assumptions about how much ships will cost, when ships will retire, and other factors that may well change between now and 2020. In an effort to be conservative, we selected assumptions that tend to increase the size of the fleet. Thus, most changes in the assumptions in this testimony--for example, increases in the unit cost of new ships or early retirement of some ships--would result in smaller fleets than those I will discuss.

My testimony today will focus only on the Navy's shipbuilding budget--that is, the Navy Shipbuilding and Conversion (SCN) account. CBO is currently analyzing Navy budgets, and particularly the SCN budget, at the request of this Subcommittee. The next phase of CBO's analysis will consider the effects of alternative shipbuilding plans on the entire Navy budget, which includes funding for aircraft as well as funds to operate the Navy's ships and aircraft.

## NAVY SHIP GOALS

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The Navy has publicly specified goals for different types of ships that taken together result in a fleet of about 585 ships (see Table 1). This objective is slightly larger than the existing fleet, which will number 547 ships at the end of 1990. According to the Navy, the 585 ships should include 14 deployable aircraft carriers, 120 cruisers and destroyers, 100 attack submarines, as well as many ships of other types.

Recent press reports suggested that, in its most recent Program Objectives Memoranda (POM), the Navy has proposed a plan for fiscal years 1992-1997 that calls for a smaller fleet of 488 ships by 1997, including 12 aircraft carriers. Later in this testimony, I will describe the budgetary effects of a program similar to the one described in the press reports. CBO does not, however, have the details of the Navy's new POM plan, which are classified. Moreover, the plan could be changed before it is formally submitted to the Congress. Therefore, I will focus initially on the current, publicly stated goal and its associated cost. Among other things, this discussion will make it clear why the Navy was under such pressure to reduce its goal for ships.

The Navy's fleet carries out three major missions. A small but important part of the Navy consists of submarines that are designed to help

TABLE 1. GOALS FOR THE SIZE OF THE NAVY FLEET  
COMPARED WITH FLEET SIZE IN 1990

Type of Ship	Current Navy Goals	Navy Goals in January 1987	1990 Fleet (Year end)
Ballistic Missile Submarines	24	20 to 40	34
Attack Submarines	100	100	90
Deployable Aircraft Carriers	14	15	14
Battleships	2	4	4
Carrier Escorts <sup>a</sup>	120	137	100
Frigates <sup>b</sup>	104	101	99
Other <sup>c</sup>	<u>221</u>	<u>220 to 225</u>	<u>206</u>
Total	585	600 <sup>d</sup>	547

SOURCE: Congressional Budget Office based on Department of Defense data.

- a. Cruisers, destroyers, and ships referred to as battle force capable (BFC) ships in the Surface Combatant Force Requirements Study.
- b. Frigates and ships referred to as protection of shipping (POS) ships in the Surface Combatant Force Requirements Study.
- c. Mine warfare, amphibious warfare, combat logistics, patrol, and support ships. The goals for these vessels may vary slightly but total approximately 221 ships.
- d. This total reflects the numbers toward the lower end of the ranges for specific types of ships.

deter nuclear war by carrying strategic nuclear missiles. Most Navy ships would be used in a conventional or nonnuclear war, where they would perform either or both of two major missions: attacking land-based targets from the sea (the power projection mission) or controlling the seas in order to protect friendly shipping (the sea control mission).

In peacetime, the Navy deploys ships around the globe in order to enhance regional stability and "show the flag." Navy officials maintain that a fleet that meets the goals is required to carry out these wartime and peacetime missions while ensuring that sailors do not spend too much time away from their families during routine, peacetime deployments.

#### Today's Goal Compared with Those of Recent Years

The goal of about 585 ships is only slightly smaller than the goal established a few years ago. Table 1 shows the Navy goal as of January 1987. At that time, the Navy felt it needed 600 ships. The reduction to about 585 ships reflects changes in several classes of ships.

Aircraft Carriers. In its budget plan submitted last year, the Navy reduced its goal for deployable aircraft carriers from 15 to 14. The size of the carrier force is important because it influences requirements for carrier escort ships

(cruisers and destroyers), logistics ships that replenish carriers at sea, and carrier-based aircraft. Throughout this testimony, CBO assumes that the Navy will continue its current practice of requiring one aircraft carrier beyond the number considered to be deployable.

Carrier Escorts and Frigates. The goals for carrier escorts (cruisers and destroyers) and for frigates--smaller ships that the Navy expects will escort convoys in time of war--have also declined modestly in recent years. In 1988, the Navy endorsed the recommendations of the Surface Combatant Force Requirements Study (SCFRS). This study recommended lowering the goal for carrier escorts and frigates from 238 ships to 224.

Ballistic Missile Submarines. Previous Navy plans indicated that the Navy's goal was between 20 and 40 ballistic missile submarines, but the Navy now says that it needs 24 such vessels. These submarines carry missiles armed with strategic nuclear warheads. The Assistant Chief of Naval Operations for Undersea Warfare recently stated that this goal of 24 ballistic missile submarines is consistent with the U.S. negotiating position in the Strategic Arms Reduction Talks (START).

START does not limit the number of missile submarines, but it does limit the total number of all types of strategic missiles and warheads. Hence, force levels for strategic submarines could be altered, depending on how the

United States allocates the total allowed number of missiles and warheads among land-based missiles, bombers, and submarines. They could also be altered by a follow-on to the proposed START treaty, which could further limit missiles and warheads.

### Future Goals Could Change

While the Navy's goal for ships has not changed much in recent years, almost everything else has. Dramatic changes in Eastern Europe and the Soviet Union have made obsolete many of the assumptions that guided defense planning in the past. In order to hold down its operating budget, the Navy's budget for 1991 announced plans to retire ships early--including two battleships, five nuclear-powered attack submarines, and two nuclear-powered cruisers. Secretary of Defense Cheney recently ordered a special review of two major shipbuilding programs (the DDG-51 guided missile destroyer and the SSN-21 attack submarine). Similar reviews of aircraft programs produced some sharp reductions in planned purchases.

Senior officials have also suggested changes in the Navy's goal for ships. In a recent speech, Senator Nunn suggested that the Navy could accomplish necessary missions with 10 to 12 aircraft carriers. Secretary of Defense Cheney also raised the possibility of fewer carriers in recent testimony, but provided no firm number. As I mentioned earlier in this

testimony, press reports indicate that the Navy itself has proposed a reduction in the size of the fleet.

Nevertheless, Navy officials have argued quite recently that the changes in Eastern Europe and the Soviet Union should not significantly affect the size of the Navy. Press reports indicate that, while proposing a smaller fleet of 488 ships to accommodate budgetary limits, these officials argued that the Navy still needs a larger fleet with 14 aircraft carriers. Therefore, the cost of meeting the Navy's goals of 14 aircraft carriers and about 585 ships may still be of budgetary interest.

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#### COST OF MEETING NAVY GOALS

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CBO estimates that, between 1991 and the year 2000, real or inflation-adjusted SCN funding would have to increase by an average of 5 percent a year if the Navy is to move toward meeting its goal for about 585 ships (see Table 2).<sup>1</sup> Funding during the period would average \$15.3 billion, compared with \$11.4 billion in 1990 and \$13.0 billion in the 1981-1990 period--years generally considered favorable for funding naval shipbuilding. (All costs in this testimony are expressed in fiscal year 1991 dollars of budget authority.)

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1. The calculation of 5 percent annual real growth assumes that the shipbuilding and conversion (SCN) appropriation for 1990 does not include funds for procuring fast sealift ships. The Congress appropriated, but did not authorize, about \$600 million for fast sealift ships for 1990. Final resolution of this issue awaits Congressional action.

**TABLE 2. SELECTED EFFECTS OF ALTERNATIVE SHIPBUILDING BUDGETS**

	Average Annual Real Growth in Funding (Percent)		Average Number of Ships Purchased Per Year		Number of Ships in the Fleet	
	1990-2000	2001-2020	1990-2000	2001-2020	2000	2020
<b>Meets Navy Goals</b>	5	2	17.1	15.8	571	559
<b>No Real Growth</b>	0	0	13.5	12.9	555	487
<b>Two Percent Annual Decline</b>	-2	0	11.8	10.6	545	438
<b>Four Percent Annual Decline</b>	-4	0	10.9	8.5	538	390

SOURCE: Congressional Budget Office.

The Navy would purchase an average of 17.1 ships each year between 1991 and 2000 (see Table 2 and Table A-1 in Appendix A of this testimony).

Annual increases would average 5 percent in the 1990s but would range widely in particular years, depending on the number and types of ships being purchased in that year. Annual funding would range between \$11.0 billion and \$19.4 billion.

Even with these substantial funding increases, goals for some types of ships would not be met by the year 2000. To meet the goal for each type of ship, and to sustain the fleet at the desired level, funding increases would be needed in the years beyond 2000, though at a much lower rate than those required in the 1990s. Over the 2001-2020 period, increases would average only about 2 percent a year. With these increases, the Navy could meet its goals for every type of ship--except frigates and other convoy escorts--by the year 2010 and sustain the fleet at the desired level.<sup>2</sup>

These estimates of increased funding are based on a number of assumptions. Ships are assumed to be retired at the end of an average service life, which varies by type of ship. If a particular type of ship has a

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2. The Navy does not reach its goal for frigates and other convoy escorts until after 2020. The Navy does not plan to buy new frigates in the future. Rather, it plans on using older (20 years and older) carrier escorts for convoy escort missions. The Navy acknowledges a shortfall of these types of ships, and CBO did not attempt to meet this shortfall. Buying new ships to meet the shortfall of convoy escorts would further increase the costs of meeting the Navy's goals.

shortfall, CBO assumes the Navy would meet it gradually by continuing to buy that type of ship at today's rates or rates planned by the Navy; if no shortfall occurs, CBO assumes enough ships would be bought to avoid creating one. CBO also assumes that costs for smaller support ships, and for overhauls and conversions, remain constant as a share of the cost of major ships. These assumptions are discussed in more detail in Appendix B of this testimony.

#### Reasons for High Growth in the 1990s

There are several reasons why large increases in SCN funding are needed over the next decade if the Navy is to move toward meeting its goals for ships. In part, the high rate reflects the need to buy new aircraft carriers. To maintain a fleet of 14 deployable carriers, while retiring carriers at the end of their assumed service life of 45 years, the Navy will have to buy five new carriers between now and the year 2000. At today's prices, each would cost about \$3.5 billion.

The Navy will also have to buy many other types of ships in order to meet its goals. Indeed, the cost of aircraft carriers in the 1991-2000 period represents a relatively small share of funding for major ships--about 13 percent (see Table A-2). But the number of carriers influences the goal for carrier escorts, which would have to be purchased in substantial numbers in

the 1990s if the goal is to be met. The Navy would also have to purchase substantial numbers of new attack submarines in the 1990s. Attack submarines and carrier escorts consume approximately two-thirds of funds for major ships.

#### Effects of Increases in Unit Costs

The rate of growth in SCN funding could be even higher than suggested by these estimates if the unit cost of new ships grows substantially. In its basic estimates, CBO assumes that unit costs for each type of ship remain constant in real terms through the year 2020. History, however, suggests that costs per ship will rise, at least for some types of ships. For example, each of the DDG-51 class of guided missile destroyers now under construction costs about two and one-half times as much to build, even after adjusting for inflation, as did each ship of the DDG-2 class that they will replace. On average, that suggests real growth in cost per ship of about 3 percent a year. A similar calculation for attack submarines results in annual real cost growth of about 4 percent. Some of these cost increases reflect improvements in capability. Cost growth in the future could also reflect lower rates of ship procurement.

Not all types of ships are likely to grow sharply in cost, but some probably will. To illustrate the effects of growth in unit costs, assume that the unit cost for all types of ships rises at an average rate of 2 percent a year.

Then SCN funding would have to increase at an average rate of 7 percent a year between 1991 and 2000 instead of 5 percent. Between 2001 and 2020, SCN costs would grow at 4 percent a year instead of 2 percent.

### EFFECTS OF REDUCED FUNDING

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The Secretary of Defense has called for reducing the total defense budget by 2 percent a year. Some Members of the Congress have called for even larger reductions--4 percent a year or more. A reduction in the threats facing naval forces is less clear than is the case for some other military forces. Thus, SCN funding possibly will not be subject to cuts as large as those imposed on the overall budget. Nevertheless, as recent press reports confirm, the SCN account is not likely to be exempt from all the budgetary cuts; it is even less likely to grow at the annual real rate of 5 percent or more required to move toward the Navy goal for ships.

To illustrate the effects on the fleet of constant or reduced funding, this testimony examines three cases that vary in the amount of SCN funds assumed to be available. Under these cases, the SCN account between 1991 and the year 2000 receives:

- o No real growth;
- o Real reductions of 2 percent a year; or
- o Real reductions of 4 percent a year.

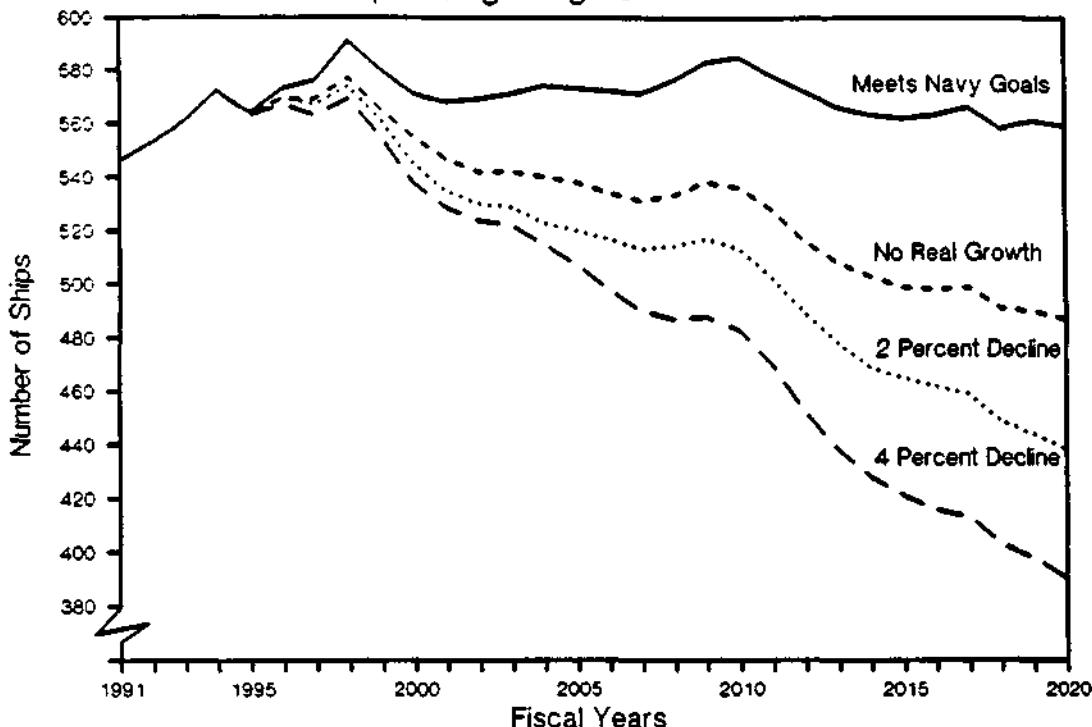
Beyond the year 2000, funding is assumed to remain constant in real terms under all three cases. Initially, all three cases assume that reductions in funding are imposed proportionally on each major type of ship (that is, aircraft carriers, ballistic missile submarines, carrier escorts, and so forth).

#### Effects on Fleet Size in the Year 2000

Since it takes many years before funding cutbacks result in fewer deployed vessels, none of the three cases would quickly reduce the size of the Navy's fleet. In the year 2000, the number of ships in the Navy would range from 538, assuming annual decline of 4 percent, to 555 ships, assuming no real growth or decline (see Figure 1). This number compares with 547 ships in the fleet today.

A gradual reduction in fleet size would suggest that--in principle--the United States could reduce SCN funding during the 1990s; then, if threats to U.S. security worsen, the country could reverse course and build up in the

Figure 1. Numbers of Ships in the Navy Fleet Under Alternative Shipbuilding Budgets



SOURCE: Congressional Budget Office.

NOTE Assumes funding declines through 2000 and is level from 2001 through 2020.

next century. It could accomplish such a reversal by a combination of increases in SCN funding in the next century and delays in retiring selected ships.

Reversing course might be more difficult than it appears, however, because of the effects of cutbacks on the U.S. shipbuilding industry. Reductions in SCN funding would alter ship purchases more quickly than the reductions would cut fleet size. Between 1991 and 2000, the average number of ships purchased would vary from 13.5 with no real growth in SCN funding, to 10.9 if funding declines by 4 percent a year (see Table 2). This amount compares with annual purchases of 17.6 ships between 1981 and 1990.

Cutbacks in ship procurement would hurt the U.S. shipbuilding industry, which relies almost exclusively on Navy shipbuilding contracts. (Only one large commercial vessel is currently on order in U.S. shipyards.) Some yards might well go out of business. With fewer shipyards, the United States would have less capability to increase ship production quickly in the event of a change in threats to U.S. security. This outcome would not preclude a reversal of the Navy's fleet size, but it would delay any such change.

#### Effects on Fleet Size in 2020

By the year 2020, the effects of alternative SCN funding on fleet size would be more pronounced.<sup>3</sup> By this time, the lower levels of funding would have been in effect for many years and would have had time to affect the size of the fleet significantly. The number of vessels would range from 390 ships, assuming an annual budgetary decline of 4 percent, to 487 ships, assuming no real growth or decline. This amount represents 11 percent to 29 percent less than the 547 ships now in the fleet.

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3. This testimony analyzes the procurement of ships and the size of the fleet through the year 2020. Because they take many years to build, aircraft carriers procured after 2012, submarines procured after 2015, and surface ships procured after 2016 would enter the fleet after 2020.

Each major type of ship would also be reduced in number by the year 2020. Assuming proportional cuts in each type of ship, the Navy would have as few as 9 aircraft carriers, with 4 percent annual budgetary decline, or as many as 12 carriers, if budgets remain constant in real terms (see Table 3). Attack submarines would range from 66 to 82. Other types of ships would also be reduced.

The smaller fleets of the year 2020 would be more capable than their numbers alone indicate. These smaller fleets would be made up of more modern ships that tend to be more effective than the vessels that they replace. According to the Navy, several newer types of ships--including the DDG-51 class of guided missile destroyers, the SSN-21 class of submarines, and the Wasp class of amphibious assault ships--carry more weapons and better sensors and electronics than the ships they replace.

Alternatively, the numbers of ships in Figure 1 may overestimate the size of fleet that would be available under various levels of funding. The estimates in Figure 1 assume no growth in cost per ship. But, as I noted earlier, history suggests that unit costs of some types of ships would grow, particularly as lower levels of funding lead to lower rates of production. This effect could be significant. For example, if the cost per ship for all types of ships grows by 2 percent a year, then by the year 2020 the Navy would have

**TABLE 3. SIZE OF THE FLEET UNDER DIFFERENT FUNDING LEVELS  
IN 2020 ASSUMING EQUAL PERCENTAGE REDUCTIONS**

Type of Ship	No Real Growth	2 Percent Real Decline	4 Percent Real Decline
Ballistic Missile Submarines	21	21	18
Attack Submarines	82	77	66
Deployable Aircraft Carriers	12	11	9
Battleships	0	0	0
Carrier Escorts <sup>a</sup>	99	83	67
Frigates <sup>b</sup>	62	62	60
Other <sup>c</sup>	<u>211</u>	<u>184</u>	<u>170</u>
Total	487	438	390

SOURCE: Congressional Budget Office.

- a. Cruisers, destroyers, and ships referred to as battle force capable (BFC) ships in the Surface Combatant Force Requirements Study.
- b. Frigates and ships referred to as protection of shipping (POS) ships in the Surface Combatant Force Requirements Study.
- c. Mine warfare, amphibious warfare, combat logistics, patrol, and support ships.

a fleet of only about 340 ships, assuming 4 percent annual declines in funding, compared with about 390 ships if costs per ship do not grow.

#### Budgetary Effects of the New Navy Plan

As I mentioned earlier in this testimony, press reports suggest that the Navy now plans on a fleet of 488 ships by 1997, including 12 aircraft carriers. CBO's analysis suggests that, in the long run, a fleet of 488 ships including 12 carriers would require an SCN budget that, on average, stays constant at today's level in real terms. This finding assumes that the Navy reduces the size of the fleet but does not substantially alter the mix of types of ships. A constant budget would not, however, lead to a fleet of 488 ships by 1997 because smaller shipbuilding budgets do not have much effect on fleet size for many years. Instead, the reduction in the size of the fleet between now and 1997 would be accomplished primarily through early retirements of older ships.

#### THE NEED TO RECONSIDER MISSIONS

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The potential for a sharply smaller fleet in the next century suggests a need to reconsider Navy missions. If it has fewer ships, the Navy could reduce its

capability to perform each of its missions proportionately. That might mean proportional reductions in submarines that provide strategic deterrence, ships that provide power projection by attacking targets on land, and ships that provide sea control.

Alternatively, the Navy might consider protecting some missions against deep cuts while accepting relatively larger reductions in others. To illustrate the effects of such a decision, CBO assessed the effects of imposing smaller cuts in two missions--strategic deterrence and power projection.

While illustrative, such a choice might be consistent with the philosophies of many military planners. Many of them assign high priority to strategic submarines; because they are so difficult to detect and destroy, they help deter a nuclear attack by ensuring the ability of the United States to retaliate. Naval forces that provide power projection may be particularly useful in smaller wars, which today seem more likely than a major conflict pitting U.S. forces against those of the Soviet Union.

Specifically, in this illustration, CBO assumes that the Navy provides all funds necessary to meet its goal of having 24 submarines capable of launching strategic missiles. Funding for forces designed primarily for projecting power is assumed to be reduced but only by half as much as assumed under the proportional reductions that I just discussed. The

illustration assumes that power projection ships include aircraft carriers (whose aircraft can attack land-based targets), carrier escorts, amphibious warfare ships (whose troops can be put ashore to attack), and logistics ships that support forward deployed naval forces. Although attack submarines can perform several tasks that are useful in the power projection mission, they are not usually considered to be designed principally for power projection and so are not protected under this illustrative approach.

When coupled with the three alternative levels of funding considered in this testimony, this emphasis on strategic deterrence and projection of power does not greatly alter estimates of the total numbers of ships. By the year 2020, the fleet would vary in size from 384 ships to 486 ships, depending on whether annual funding declines by 4 percent or does not decline at all (see Table 4). This range is similar to the range assuming proportional cuts in funding for all types of ships.

However, the composition of the fleet in the year 2020 would be quite different. Ships involved principally in power projection would remain close to the Navy goal. For example, under all three funding levels, the Navy has 13 or 14 deployable aircraft carriers--at or close to the goal of 14 carriers. Carrier escorts range from 96 to 104 ships--reasonably close to the Navy's goal of 120 such ships.

**TABLE 4. SIZE OF THE FLEET UNDER DIFFERENT FUNDING LEVELS  
IN 2020 ASSUMING INCREASED EMPHASIS ON SHIPS USED  
FOR POWER PROJECTION AND STRATEGIC DETERRENCE**

Type of Ship	No Real Growth	2 Percent Real Decline	4 Percent Real Decline
Ballistic Missile Submarines	24	24	24
Attack Submarines	71	51	34
Deployable Aircraft Carriers	14	13	13
Battleships	0	0	0
Carrier Escorts <sup>a</sup>	104	101	96
Frigates <sup>b</sup>	68	66	66
Other <sup>c</sup>	<u>205</u>	<u>174</u>	<u>151</u>
Total	486	429	384

SOURCE: Congressional Budget Office.

- a. Cruisers, destroyers, and ships referred to as battle force capable (BFC) ships in the Surface Combatant Force Requirements Study.
- b. Frigates and ships referred to as protection of shipping (POS) ships in the Surface Combatant Force Requirements Study.
- c. Mine warfare, amphibious warfare, combat logistics, patrol, and support ships.

But ships involved primarily in sea control decline precipitously. Even with no real growth, there are only 71 attack submarines. With 4 percent annual budgetary declines, the Navy of the year 2020 would have a force of only 34 attack submarines.

The results suggest a difficult problem for planners. If budget cuts are deep, then favoring one mission over another drastically reduces the less favored mission. The results also reflect a trend in future shipbuilding budgets. Over the next 30 years, funding in the shipbuilding account will be concentrated in two programs: attack submarines and ships that escort aircraft carriers. If total budgets do not grow, or decline, emphasizing the procurement of one of these two types will require significant reductions in procurement of the other.

## CONCLUSION

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Defense budgets are likely to decline over the next few years, perhaps sharply. It is too early to know how much of that decline will be visited on the shipbuilding budget, but it probably will not escape entirely. If shipbuilding budgets decline, the fleet will eventually decline in size. For example, assuming 4 percent annual declines, the fleet in the year 2020 would have no more than about 390 ships, about two-thirds of today's size.

Such a decline may require the Navy to reconsider the priority of its missions, emphasizing one or more over others. It is not too soon to begin to reconsider these missions. The sooner the process begins, the more time will be available to make the difficult but important decisions about the size and composition of the fleet the Navy will operate in the 21st century.

APPENDIXES

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APPENDIX A. TABLES

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TABLE A-1. SHIP PURCHASES REQUIRED TO MEET NAVY GOALS, 1991-2020

Designator <sup>a</sup>	Type of Ship	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
AGF	Command Ship	0	0	0	0	0	0	0	0	1	0
AGOS	Surveillance Ship	0	3	3	2	0	0	0	0	0	0
AK	Cargo Ship	0	0	0	0	0	0	0	0	0	0
AOE	Logistics Station Ship	1	0	3	0	1	1	0	1	0	1
AOEV	Logistics Shuttle Ship	0	0	0	0	2	0	1	0	0	1
AR	Repair Ship	0	0	0	1	0	0	1	1	1	2
AS	Submarine Tender	0	0	0	0	0	3	0	0	0	0
ASR	Rescue Ship	0	0	0	0	0	0	2	1	0	0
ATF	Fleet Tug	0	0	0	0	0	0	0	0	0	0
ATR	Salvage/Rescue Ship	0	0	0	1	0	3	0	0	0	0
CVN	Aircraft Carrier	0	0	0	0	1	1	0	1	1	1
DDG	Guided Missile Destroyer	5	10	0	10	0	6	6	6	6	6
LHD	Amphibious Assault Ship	1	0	1	0	1	0	1	0	0	1
LSD	Dock Landing Ship	1	1	1	1	1	1	1	0	0	0
LX	New Amphibious Ship	0	0	0	0	0	1	0	2	2	3
MCM	Mine Countermeasure Ship	0	0	0	0	0	0	0	0	0	0
MHC	Coastal Mine Hunter	3	4	5	0	0	0	0	0	0	0
PHM	Small Combatant	0	0	0	0	0	0	0	0	0	0
SSBN	Ballistic Missile Submarine	1	1	1	1	1	1	1	0	0	0
SSN	Attack Submarine	2	0	6	0	7	4	4	4	4	4
Total		14	19	20	16	14	21	17	16	15	19

(Continued)

TABLE A-1. (Continued)

Designator <sup>a</sup>	Type of Ship	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
AGF	Command Ship	0	0	0	0	0	1	0	0	0	0
AGOS	Surveillance Ship	0	0	0	0	0	0	0	0	0	3
AK	Cargo Ship	0	0	1	0	0	0	0	0	0	0
AOE	Logistics Station Ship	0	1	0	1	0	1	0	1	0	0
AOEV	Logistics Shuttle Ship	1	0	1	0	1	0	1	0	1	1
AR	Repair Ship	0	0	0	0	0	0	0	1	1	0
AS	Submarine Tender	0	0	1	1	1	1	0	0	0	0
ASR	Rescue Ship	0	0	0	0	0	0	0	0	0	0
ATF	Fleet Tug	0	0	0	0	0	0	0	0	0	0
ATR	Salvage/Rescue Ship	0	0	0	0	0	0	1	2	0	0
CVN	Aircraft Carrier	0	1	0	0	1	0	0	0	0	0
DDG	Guided Missile Destroyer	6	6	6	6	6	6	6	6	4	6
LHD	Amphibious Assault Ship	0	0	0	0	0	0	0	1	1	1
LSD	Dock Landing Ship	0	0	0	0	0	0	0	0	0	0
LX	New Amphibious Ship	3	3	3	3	3	3	0	0	0	0
MCM	Mine Countermeasure Ship	0	0	0	0	0	0	0	0	0	0
MHC	Coastal Mine Hunter	0	0	0	0	0	0	0	0	0	0
PHM	Small Combatant	0	0	0	1	0	0	1	3	1	0
SSBN	Ballistic Missile Submarine	0	0	0	0	0	1	1	1	2	1
SSN	Attack Submarine	3	3	4	2	2	4	4	4	4	4
<b>Total</b>		<b>13</b>	<b>14</b>	<b>16</b>	<b>14</b>	<b>14</b>	<b>17</b>	<b>14</b>	<b>19</b>	<b>14</b>	<b>16</b>

(Continued)

TABLE A-1. (Continued)

Designator <sup>a</sup>	Type of Ship	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
AGF	Command Ship	0	0	0	0	0	0	0	0	0	0	2
AGOS	Surveillance Ship	4	2	1	2	5	2	3	1	0	0	31
AK	Cargo Ship	0	0	0	0	0	0	0	0	0	0	1
AOE	Logistics Station Ship	0	0	0	0	0	0	0	0	0	0	12
AOEV	Logistics Shuttle Ship	1	1	1	1	1	1	3	1	1	0	21
AR	Repair Ship	0	0	0	0	0	0	0	0	0	0	8
AS	Submarine Tender	1	1	0	0	0	0	0	0	1	0	10
ASR	Rescue Ship	0	0	0	0	0	0	0	0	0	0	3
ATF	Fleet Tug	0	0	0	0	2	3	2	0	0	0	7
ATR	Salvage/Rescue Ship	0	0	0	0	0	0	0	0	0	0	7
CVN	Aircraft Carrier	0	1	0	1	0	0	0	0	0	1	10
DDG	Guided Missile Destroyer	7	5	10	0	10	0	6	6	7	5	169
LHD	Amphibious Assault Ship	1	0	0	0	0	0	0	0	0	1	10
LSD	Dock Landing Ship	0	0	0	0	0	0	0	0	0	0	7
LX	New Amphibious Ship	0	0	0	0	0	1	1	1	1	0	30
MCM	Mine Countermeasure Ship	0	0	1	0	3	3	1	3	2	1	14
MHC	Coastal Mine Hunter	0	0	0	0	0	0	1	1	2	1	17
PHM	Small Combatant	0	0	0	0	0	0	0	0	0	0	6
SSBN	Ballistic Missile Submarine	2	0	1	1	1	1	1	1	1	1	23
SSN	Attack Submarine	3	2	2	3	3	4	4	3	2	4	99
<b>Total</b>		<b>19</b>	<b>12</b>	<b>16</b>	<b>8</b>	<b>25</b>	<b>15</b>	<b>22</b>	<b>17</b>	<b>17</b>	<b>14</b>	<b>487</b>

SOURCE: Congressional Budget Office.

a. Designators are symbols used by the Navy to refer to ship types. They are not acronyms.

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TABLE A-2. SHARES OF MAJOR SHIP PROCUREMENT FUNDING,  
BY TYPE OF SHIP (In percent)

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Type of Ship	1991-2000	1991-2020
Attack Submarines	34	35
Carrier Escorts	31	34
Aircraft Carriers	13	9
Ballistic Missile Submarines	7	8
All Other Major Ships	15	14

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SOURCE: Congressional Budget Office.

NOTE: Estimates assume that the Navy receives all funding required to move toward its current goals.

APPENDIX B

METHODS USED TO ESTIMATE THE SHIPBUILDING COST OF  
MEETING THE NAVY'S GOAL

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This appendix describes the method used to estimate the numbers and types of ships necessary to meet the Navy's goal and the cost of those ships. An analogous method was used to estimate the size of the fleet that would result if SCN budgets are held constant or decline in real terms.

The need to buy new ships depends on when vessels currently in the fleet will retire, and whether the number of ships in the fleet in any year represents a shortfall relative to the Navy's goals. The cost of buying those ships depends primarily on the unit cost of new vessels.

#### PLANNED RETIREMENTS

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The Navy's need to buy new ships to meet its goals is determined in part by the retirement of ships currently in service. For planning purposes, the Navy assumes that ships retire at the end of an average expected service life, which varies by ship class. Specifically, aircraft carriers are assumed to retire after 45 years; newer aircraft carrier escorts and all auxiliary ships after 40 years; amphibious warfare ships after 35 years; ballistic missile submarines, attack submarines, and frigates after 30 years. The analysis assumes that after aircraft carrier escorts reach 20 years of age, they will perform roles currently performed by frigates.

The Navy retains flexibility in deciding when to retire ships. Some ships will remain in service past their expected retirement date if they can continue to perform their missions in a cost-effective manner. Others will be retired before they reach the end of their expected service life because they can no longer perform their wartime missions effectively or because they are too expensive to continue to operate. Recently, as a response to reduced budgets, the Navy has decided to retire ships before they reach the end of their expected service life. The assumptions on service life used in this analysis, therefore, are unlikely to be applied in a strict manner to all ships. Rather, they are reasonable estimates that are consistent with current Navy planning and practices.

#### DECIDING WHEN TO BUILD NEW SHIPS

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CBO developed a shipbuilding model that estimates the number of major ships that would have to be funded in each year between 1991 and 2020 to reach and sustain the Navy's goals. This results of this model are detailed in Table A-1.

For fiscal years 1991 to 1994, CBO assumed that ships were funded in accord with the shipbuilding plan that the Navy submitted to the Congress with its 1991 budget request.

The Navy's shipbuilding plan for 1995 and subsequent years is not publicly available. For each of these years, CBO estimated shipbuilding requirements using one of two methods.

For types of ships for which the number of vessels in the fleet fell short of the Navy's goals, the plan continues to fund ship construction--at production rates similar to those the Navy envisioned for 1991 to 1994--until the goals are reached. For example, the Navy is well short of its goal for surface ship escorts for aircraft carriers, and the Surface Combatant Force Requirements Study, which the Navy endorsed in 1988, recommended construction of five or six new carrier escorts per year. Thus, the estimates for 1995 and later years fund six new escorts per year until the goal of 120 escorts is met, around 2010.

For ships for which the number of vessels in the fleet matched the goal, the shipbuilding plan funded the construction of new ships only to replace older vessels when they are retired at the end of their expected service life. This method ensures that shortfalls will be prevented once goals have been reached.

Because ships take many years to build, CBO assumed that the Congress would fund most new ships four years before they are needed to

replace retiring vessels. Aircraft carriers would be funded about eight years in advance and submarines five years in advance because they take longer to build. In some cases, the service life of aircraft carriers was extended slightly to account for the fixed capacity in the one shipyard in the country that builds carriers.

### ESTIMATING COSTS

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For most ship types, CBO based its estimates of shipbuilding costs on recent ship purchases and purchases in the near future for which the Navy has provided the Congress with budget information. For some ships, especially support ships that have not been procured recently, we used historical costs to estimate the cost of replacement ships.

CBO assumed that unit construction costs for ships remain constant in real terms through 2020. While recognizing that such projections are inherently uncertain, this assumption is probably an optimistic one. Historical analyses of new ship construction costs indicate that new ship costs rise over time, especially between generations of ships. Should ship production rates fall, as they could if the shipbuilding budget is reduced, then ship costs could reasonably be expected to rise above those assumed. Unit costs could also increase because of modifications designed to meet new threats. CBO did

provide an alternative estimate of the size of future SCN budgets assuming that unit costs rise by an average of 2 percent a year in real terms.

To arrive at total costs for meeting the Navy's goal, we summed the amounts required for major ships, then increased that amount to account for items other than major ships that are funded in the SCN account. In addition to major ships, the SCN account funds programs such as the procurement of smaller vessels and major overhauls for aircraft carriers. These other programs totaled about 14 percent of the SCN account between 1981 and 1990. CBO assumed that this percentage would remain constant over the next 30 years and added these costs to the costs of major ships to estimate total SCN funding.